

Work Order ID 132986

Thursday, May 21, 2015 7:18:06 AM

132986

Page 1

Item ID: D412-664-443TRN

Accept

N900040100Setup Start ***NS1***

Revision ID:

Stop ***NS2***

Item Name: Crosstube Turning Detail

Start Date: 5/21/2015 Start Qty: 1.00

1

Cust Item ID:

Required Date: 5/21/2015 Req'd Qty: 1.00

1

Customer:

Reference:

Approvals:

Process Plan:

MLJ

Date:

MAY 21 2015

Tooling:

Date:

QC:

Date:

SPC (Y/N):

Date:

Run Start ***NR1***Stop ***NR2***

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
Draw Nbr	Revision Nbr								
D412-664-443	REV A U/R								

100

0.00

100

MORI SEIKI CNC LATHE LARGE

Mori Seiki

Memo

0.00

Mori Seiki CNC Lathe Large

1-Cut tube on chop saw, leave extra mat'l for facing.
2-Face tube to length.

1 ϕ _____
mml
15/07/13

110

QC1- Inspection performed by CMM

0.00

110

QC

Memo

0.00

Quality Control

1 ϕ _____
mml
15/07/13

DQA: _____ Date: _____



WORK ORDER NON-CONFORMANCE / UPDATE

QA Closed: _____ Date: _____

Work Order update only ☐

Work Order: _____ Part No. _____ NCR No. _____	DISPOSITION Rework ☐ Scrap ☐ Use-as-is ☐ Suspected Unapproved ☐	AGAINST DEPARTMENT/PROCESS <table style="width:100%; border: none;"> <tr> <td style="border: none;">Skid-tube ☐</td> <td style="border: none;">Cross tube ☐</td> <td style="border: none;">Water Jet ☐</td> <td style="border: none;">Engineering ☐</td> </tr> <tr> <td style="border: none;">Machining ☐</td> <td style="border: none;">Small Fab ☐</td> <td style="border: none;">Prod. Eng. Coord. ☐</td> <td style="border: none;">Quality ☐</td> </tr> <tr> <td style="border: none;">Thermoforming ☐</td> <td style="border: none;">Finishing ☐</td> <td style="border: none;">Rec/Store/Packaging ☐</td> <td style="border: none;">Other ☐</td> </tr> <tr> <td style="border: none;">Large Fab ☐</td> <td style="border: none;">Composite ☐</td> <td style="border: none;">Supplier ☐</td> <td></td> </tr> </table>				Skid-tube ☐	Cross tube ☐	Water Jet ☐	Engineering ☐	Machining ☐	Small Fab ☐	Prod. Eng. Coord. ☐	Quality ☐	Thermoforming ☐	Finishing ☐	Rec/Store/Packaging ☐	Other ☐	Large Fab ☐	Composite ☐	Supplier ☐																																																
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Work Order ID 132986

Thursday, May 21, 2015 7:18:06 AM

132986

Page 2

Item ID: D412-664-443TRN

Accept

N900040100Setup Start ***NS1***

Revision ID:

Stop ***NS2***

Item Name: Crosstube Turning Detail

Start Date: 5/21/2015 Start Qty: 1.00 ***1***

Cust Item ID:

Required Date: 5/21/2015 Req'd Qty: 1.00 ***1***

Customer:

Reference:

Approvals: Process Plan: _____ Date: _____ Tooling: _____ Date: _____

Run Start ***NR1***

QC: _____ Date: _____ SPC (Y/N): _____ Date: _____

Stop ***NR2***

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
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120

120

Mori Seiki

Mori Seiki CNC Lathe Large

MORI SEIKI CNC LATHE LARGE

Memo

0.00

1-Fill tube with sand & install plugs on both ends
2-Turn as per Folio FB216
3- File transition lines smooth.
4-Scribe part # as per Dwg D412-664-443
FOLIO REV: H
DWG REV: D

130

130

QC

Quality Control

QC1- Inspection performed by CMM

0.00

Memo

0.00

140

140

QC

Quality Control

QC8- Inspect parts - second check

0.00

Memo

0.00

1 0
15/07/15
15/07/20
P.T.O. → DAS
47
15-09-16 9-89

DQA:

Date: 25/09/28



WORK ORDER NON-CONFORMANCE / UPDATE

QA Closed:

Date: 15/09/22

Work Order update only

Work Order: 132986		DISPOSITION		AGAINST DEPARTMENT/PROCESS					
Part No. D412-664-4431RN		Rework ☒		Skid-tube ☐	Cross tube ☒	Water Jet ☐	Engineering ☐		
NCR No. 15-5351		Scrap ☐		Machining ☐	Small Fab ☐	Prod. Eng. Coord. ☐	Quality ☐		
		Use-as-is ☐		Thermoforming ☐	Finishing ☐	Rec/Store/Packaging ☐	Other ☐		
		Suspected Unapproved ☐		Large Fab ☐	Composite ☐	Supplier ☐			
Date: 15.07-22		Step #: 120		QTY Effective: ①			MRB (QSI042) Approval		
Description Work Order Deviation				Disposition			DAS 12 9-89 K.9.16		
Vibration Caused Chatter at 15" measurement OD. is 2.770" (0.006" under tol) tool insert SNAPPED.				Grind Machining MARKS, Re-check * O.D./Wall thickness - after grinding O.D. is 2.765" to 2.770" measuring EACH QUADRANT - wall thickness is W1 0.206 W2 0.192 W3 0.198 W4 0.204 Acceptable. wall thickness is OK and location is not critical in bonding			Completed By DAS 12 9-89 K.9.16		
							Lead hand / Supervisor Approval Verification TW 15-9-16		
							QC / QA Coordinator Approval DAS 9 9-89 15-09-16		
Root Cause				FAULT CATEGORY					
Environment ☐	No Re-verification ☐	Pressure/Forced ☐	Temperature/Cure ☐	Power Loss/Surge ☐	Positioned Wrong ☐				
Design ☐	Operator ☐	Bending ☐	Set-up ☐	Folio/Program ☐	Outside Dimensions ☐				
Doc/Data ☐	Offset/Setup ☐	Centre Not Concentric ☐	BOM/Route ☐	Grain ☐	Over/Under tolerance ☐				
Equip/Tooling ☒	Supplier ☐	Cracks ☐	Broken/Damage/Defect ☐	Weld ☐	Part Incorrect ☐				
Handling/Pre ☐	Training ☐	Crimp/Kink/Ripple/Wave ☐	Inspection Incomplete/Unqualified ☐	Wrong Stock Pulled ☐	Part Lost/Missing ☐				
Material ☐	Use for Testing ☐	Cuffs ☐	Contamination ☐	Out of Sequence ☐	Part Moved ☐				
Internal Transport ☐	Poor Information ☐	Crushing ☐	Countersink ☐	Off-set ☐	Drawing ☐				
Tribal Knowledge ☐	Rushing ☐	Heat Treat ☐	Cut Too Short ☐	Mislabeled ☐	☒ Finish				
LOA ☐	Product Improvement ☐	Wave/Twist in Tube ☐	Instructions Incomplete/Unclear ☐	Fit/Function ☐	Misread ☐				
Substation ☐	Process Improvement ☐	Marks/Chatter ☐	Drill Holes ☐	Misaligned/off center ☐	Turning Sequence ☐				
Past Expiry Date ☐	Manufacturing Process ☐								
Misidentified ☐	Past Due ☐	OTHER :							

Work Order ID 132986

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132986

Page 3

Item ID: D412-664-443TRN

Accept

N900040100

Setup Start

NS1

Revision ID:

Item Name: Crosstube Turning Detail

Stop

NS2

Start Date: 5/21/2015 Start Qty: 1.00

1

Cust Item ID:

Required Date: 5/21/2015 Req'd Qty: 1.00

1

Customer:

Reference:

Approvals: Process Plan: _____ Date: _____ Tooling: _____ Date: _____

Run Start

NR1

QC: _____ Date: _____ SPC (Y/N): _____ Date: _____

Stop

NR2

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
150		0.00							
150	Large Fab								
Crosstubes	Memo	0.00							
Crosstubes	Grind machining marks smooth longitude way.								
180		0.00							
180	QC15- Crosstube Dimensional Check								
QC	Memo	0.00							
Quality Control									
190		0.00							
190	Identify as per dwg & Stock Location: <u>LG 003</u>								
Packaging	Packaging								
Packaging	Memo	0.00							
	LOCATION : LG014								

BL 15/09/16

QC 15/09/16 DAS 9 9-89

BL 15/09/16

DQA: _____ Date: _____



WORK ORDER NON-CONFORMANCE / UPDATE

QA Closed: _____ Date: _____

Work Order update only ☐

Work Order: _____ Part No. _____ NCR No. _____	DISPOSITION Rework ☐ Scrap ☐ Use-as-is ☐ Suspected Unapproved ☐	AGAINST DEPARTMENT/PROCESS Skid-tube ☐ Machining ☐ Thermoforming ☐ Large Fab ☐ Cross tube ☐ Small Fab ☐ Finishing ☐ Composite ☐ Water Jet ☐ Prod. Eng. Coord. ☐ Rec/Store/Packaging ☐ Supplier ☐ Engineering ☐ Quality ☐ Other ☐			
Date :	Step #:	QTY Effective :		MRB (QSI042) Approval Completed By Lead hand / Supervisor Approval Verification QC / QA Coordinator Approval	
Description Work Order Deviation		Disposition			
Root Cause		FAULT CATEGORY			
Environment ☐ Design ☐ Doc/Data ☐ Equip/Tooling ☐ Handling/Pre ☐ Material ☐ Internal Transport ☐ Tribal Knowledge ☐ LOA ☐ Substation ☐ Past Expiry Date ☐ Misidentified ☐	No Re-verification ☐ Operator ☐ Offset/Setup ☐ Supplier ☐ Training ☐ Use for Testing ☐ Poor Information ☐ Rushing ☐ Product Improvement ☐ Process Improvement ☐ Manufacturing Process ☐ Past Due ☐	Pressure/Forced ☐ Bending ☐ Centre Not Concentric ☐ Cracks ☐ Crimp/Kink/Ripple/Wave ☐ Cuffs ☐ Crushing ☐ Heat Treat ☐ Wave/Twist in Tube ☐ Marks/Chatter ☐	Temperature/Cure ☐ Set-up ☐ BOM/Route ☐ Broken/Damage/Defect ☐ Inspection Incomplete/Unqualified ☐ Contamination ☐ Countersink ☐ Cut Too Short ☐ Instructions Incomplete/Unclear ☐ Drill Holes ☐	Power Loss/Surge ☐ Folio/Program ☐ Grain ☐ Weld ☐ Wrong Stock Pulled ☐ Out of Sequence ☐ Off-set ☐ Misabeled ☐ Fit/Function ☐ Misaligned/off center ☐	Positioned Wrong ☐ Outside Dimensions ☐ Over/Under tolerance ☐ Part Incorrect ☐ Part Lost/Missing ☐ Part Moved ☐ Drawing ☐ Finish ☐ Misread ☐ Turning Sequence ☐
OTHER : ☐					

Work Order ID 132986

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132986

Page 4

Item ID: D412-664-443TRN

Accept

N900040100

Setup Start

NS1

Revision ID:

Stop

NS2

Item Name: Crosstube Turning Detail

Start Date: 5/21/2015 Start Qty: 1.00

1

Cust Item ID:

Required Date: 5/21/2015 Req'd Qty: 1.00

1

Customer:

Reference:

Approvals: Process Plan: _____ Date: _____ Tooling: _____ Date: _____

Run Start

NR1

QC: _____ Date: _____ SPC (Y/N): _____ Date: _____

Stop

NR2Sequence ID/
Work Center IDOperation
DescriptionSet Up/
Run Hours

Tool ID

Tool #

Plan
CodeAccept
QtyReject
QtyReject
NumberInsp.
Stamp

200

QC21- Final Inspection - Work Order Release

0.00

200

QC

Memo

0.00

Quality Control

MCJ

SEP 21 2015

MCJ

SEP 21 2015

DQA: _____ Date: _____



WORK ORDER NON-CONFORMANCE / UPDATE

QA Closed: _____ Date: _____

Work Order update only ☐

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OTHER :																																																																				

Picklist Print

Thursday, May 21, 2015 7:18:10 AM

Page 1
J

Work Order ID: 132986

132986

Parent Item: D412-664-443TRN

D412-664-443TRN

Parent Item Name: Crosstube Turning Detail

Start Date: 5/21/2015

Required Date: 5/21/2015

Start Qty: 1.00

Required Qty: 1.00

Comments: IPP REV:A NEW ISSUE 13-09-26 JLM VERIFIED BY:DD

Component Item ID/ Item Name	Replacement Item ID	Mfg/ Purch	Bin Item	Primary Location	Last Location	Route Seq ID	Unit of Measure	Qty on Hand	Qty per Kit	Total Qty	Qty Issued	Date Issued	Status
D6020-160		Manufactured	No				Each	21.0000		1			

D6020-160

Crosstube Material

Location

Loc Qty

Loc Code

HALL

21

126259

21

1 marc 15/07/13

DQA: _____ Date: _____



WORK ORDER NON-CONFORMANCE / UPDATE

QA Closed: _____ Date: _____

Work Order update only ☐

Work Order: _____ Part No. _____ NCR No. _____	DISPOSITION Rework ☐ Scrap ☐ Use-as-is ☐ Suspected Unapproved ☐	AGAINST DEPARTMENT/PROCESS Skid-tube ☐ Machining ☐ Thermoforming ☐ Large Fab ☐ Cross tube ☐ Small Fab ☐ Finishing ☐ Composite ☐ Water Jet ☐ Prod. Eng. Coord. ☐ Rec/Store/Packaging ☐ Supplier ☐ Engineering ☐ Quality ☐ Other ☐			
Date :	Step #:	QTY Effective :		MRB (QSI042) Approval	
Description Work Order Deviation		Disposition		Completed By	
				Lead hand / Supervisor Approval Verification	
				QC / QA Coordinator Approval	
Root Cause		FAULT CATEGORY			
Environment ☐ Design ☐ Doc/Data ☐ Equip/Tooling ☐ Handling/Pre ☐ Material ☐ Internal Transport ☐ Tribal Knowledge ☐ LOA ☐ Substation ☐ Past Expiry Date ☐ Misidentified ☐ No Re-verification ☐ Operator ☐ Offset/Setup ☐ Supplier ☐ Training ☐ Use for Testing ☐ Poor Information ☐ Rushing ☐ Product Improvement ☐ Process Improvement ☐ Manufacturing Process ☐ Past Due ☐	Pressure/Forced ☐ Bending ☐ Centre Not Concentric ☐ Cracks ☐ Crimp/Kink/Ripple/Wave ☐ Cuffs ☐ Crushing ☐ Heat Treat ☐ Wave/Twist in Tube ☐ Marks/Chatter ☐ Temperature/Cure ☐ Set-up ☐ BOM/Route ☐ Broken/Damage/Defect ☐ Inspection Incomplete/Unqualified ☐ Contamination ☐ Countersink ☐ Cut Too Short ☐ Instructions Incomplete/Unclear ☐ Drill Holes ☐	Power Loss/Surge ☐ Folio/Program ☐ Grain ☐ Weld ☐ Wrong Stock Pulled ☐ Out of Sequence ☐ Off-set ☐ Misabeled ☐ Fit/Function ☐ Misaligned/off center ☐ Positioned Wrong ☐ Outside Dimensions ☐ Over/Under tolerance ☐ Part Incorrect ☐ Part Lost/Missing ☐ Part Moved ☐ Drawing ☐ Finish ☐ Misread ☐ Turning Sequence ☐			
OTHER : ☐					

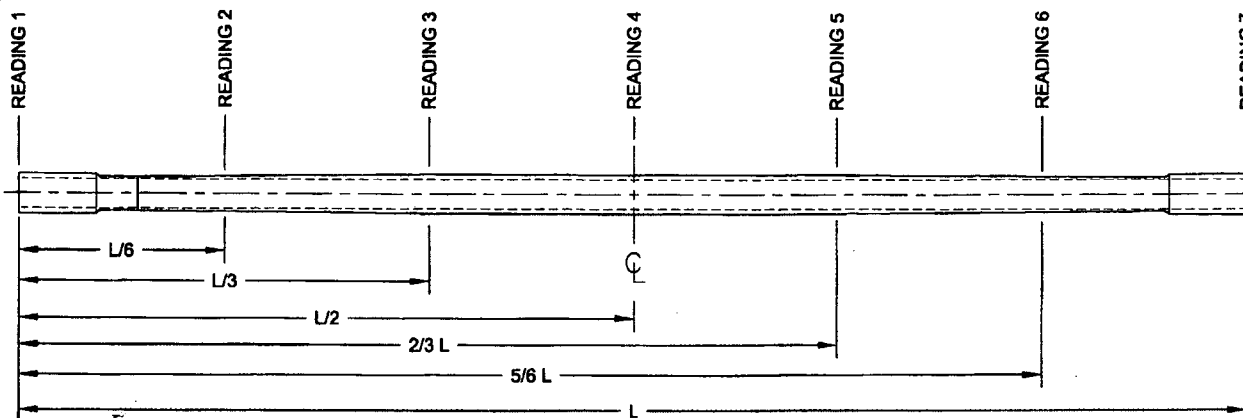
DART AEROSPACE LTD	Work Order: 132986
Description: Crosstube Assembly (412 High Aft SS)	Part Number: D412-664-443
Inspection Dwg: D412-664-443 Rev: A	Page 1 of 2

FIRST ARTICLE INSPECTION CHECKLIST

Inspection Sheet	Drawing Dimension	Tolerance	Actual Dimension	Accept	Reject	Method of Inspection	Comments
SIDE A	2.776	+0.005/-0.000	2.779	/		vern	CNC-08
	2.776	+0.005/-0.000	2.777	/			
	2.880	+0.005/-0.000	2.884	-			
	2.990	+0.005/-0.000	2.992	-			
	3.100	+0.005/-0.000	3.104	/			
	3.250	+0.005/-0.000	3.253	/			
	7.980	+/-0.060	8.00	/			
	0.063	+/-0.010	.063	/		vern	CNC-08
	0.500	+/-0.010	.500	/		R6	
	2.990	+0.005/-0.000	2.993	/		II	
						vern	CNC-08
SIDE B	2.776	+0.005/-0.000	2.763		-	vern	CNC-08
	2.776	+0.005/-0.000	2.763		-		
	2.880	+0.005/-0.000	2.884	-			
	2.990	+0.005/-0.000	2.991	-			
	3.100	+0.005/-0.000	3.104	/			
	3.250	+0.005/-0.000	3.253	/			
	7.98	+/-0.060	8.00	-		vern	CNC-08
	R0.06	+/-0.010	.063	/		R6	
	R0.50	+/-0.010	.500	/		II	
	Ø2.990	+0.005/-0.000	2.984		-	vern	CNC-08
			2.994		-		
	130.10	+/-0.060	130.10			tape	LG-11

DART AEROSPACE LTD	Work Order: 132986
Description: Crosstube Assembly (412 High Aft SS)	Part Number: D412-664-443
Inspection Dwg: D412-664-443 Rev: A	Page 2 of 2

WALL THICKNESS MEASUREMENT



Location	WALL THICKNESS MEASUREMENT (IN)				Deviation Δw (max-min)	TOLERANCE
	w1	w2	w3	w4		
READING 1 L= 0"	.311	.309	.311	.313	.004	0.073"
READING 2 L= 22	.206	.202	.206	.203	.004	
READING 3 L= 43	.321	.318	.314	.317	.007	
READING 4 L= 65	.445	.444	.440	.438	.007	
READING 5 L= 87	.318	.319	.319	.316	.001	
READING 6 L= 108	.208	.203	.206	.212	.009	
READING 7 L= 130	.314	.310	.311	.315	.005	

Calibration Result

Actual Block Thickness: .100 .500

Sitestcan 250 Measured Thickness: .100 .500

DAS
47

Measured by: <i>mmL</i>
Date: <i>15/07/20</i>

Audited by: <i>9-89</i>
Date: <i>15-09-16</i>

Preliminary Approval:
Date:

Rev	Date	Change	Revised by	Approved
A	14.06.24	New Issue (P/O D412-664-403)	KJ <i>[Signature]</i>	<i>[Signature]</i>

Item	Qty -443	Part Number	Description
1	X	D412-664-443	CROSSTUBE ASSEMBLY (412 HI AFT)
2	1	D6020-132	CROSSTUBE MATERIAL (132" MIN. LENGTH)
3	2	D3595-063-530	RUBBER CUSHION
4	1	D4909-1	SUPPORT
5	2	D4910-1	CHAFING SHIELD
7	4	MS21920-26	CLAMP
8	2	MS21920-28	CLAMP
9	A/R	SCOTCH-WELD DP460	EPOXY ADHESIVE, 3M SCOTCH-WELD
10	A/R	PROSEAL 890	SEALANT

GENERAL NOTES:

- 1) MATERIAL: MANUFACTURED FROM D6020-132
FINISHED LENGTH = 130.10±0.060 (BEFORE BENDING/TRIMMING)
- 2) FINISH: PRIME INSIDE AND OUTSIDE PER DART QSI 005 4.2
MASK UNDERSIDE OF CROSSTUBE AS SHOWN (ZN C6-2, HATCHED AREA)
PAINT OUTSIDE PER DART QSI 005 4.2
AFTER PAINTING, REMOVE MASKING AND APPLY MATTE CLEAR COAT PER DART QSI 005 4.2
- 3) TOLERANCES ARE PER DART QSI 018 UNLESS OTHERWISE NOTED.
- 4) UNITS: INCHES UNLESS OTHERWISE NOTED.
- 5) BREAK SHARP EDGES: 0.005 TO 0.010 MAX.
- 6) IDENTIFICATION: SCRIBE DART P/N "D412-664-443" AND B/N ON INSIDE OF CUFF PER DART QSI 044 6.4 (VIBRATING STYLUS)
- 7) WEIGHT: 80.2 lb AFTER MACHINING
88.7 lb FINISHED WEIGHT
- 8) PART IS SYMMETRIC ABOUT CENTERLINE.
- 9) EXTREME CARE MUST BE TAKEN TO PROTECT THE OUTSIDE SURFACE OF THE TUBE. THE OUTSIDE SURFACE MUST BE SMOOTH AND FREE FROM SURFACE DEFECTS SUCH AS SCRATCHES, NICKS, OR DENTS. DEFECTS UP TO 0.005" MAY BE BLENDED OUT LONGITUDINALLY. CIRCUMFERENTIAL GRIND MARKS ARE UNACCEPTABLE.

BENDING

- 10) BEND PROGRESSIVELY WITH A MINIMUM OF 8 PASSES. MAXIMUM TUBE FLATTENING DUE TO BENDING IS 7% (BASED ON O.D.) IN LOWER HALF OF R35 BEND AND 6% (BASED ON O.D.) ON REMAINING TUBE.
- 11) LIQUID PENETRANT INSPECT OUTSIDE SURFACE OF CROSSTUBE PER QSI 038. TO BE PERFORMED AFTER FINAL POST-BEND GRINDING. ANY ADDITIONAL GRINDING REQUIRES ANOTHER LPI INSPECTION.

ASSEMBLY

- 12) INSTALL D4909-1 CENTER SUPPORT USING A 0.04" TO 0.07" THICK LAYER OF SCOTCH-WELD DP460 PER QSI 015.
- 13) INSTALL MS21920-28 CLAMPS WITH D3595-063-530 RUBBER CUSHIONS TO SECURE THE D4909-1 SUPPORT ON TOP SIDE OF THE CROSSTUBE. ENSURE CLAMPS ARE ON TOP OF CROSSTUBE SUPPORT.
- 14) IF NOT ALREADY PRESENT ON CHAFING SHIELD, APPLY A THIN COAT OF PROSEAL 890 ON INSIDE CONCAVE SURFACE OF D4910-1 CHAFING SHIELD AND LET CURE PER MANUFACTURER'S INSTRUCTIONS. INSTALL PROSEALED D4910-1 CHAFING SHIELD ONTO CROSSTUBE BY APPLYING A THIN COAT OF PROSEAL 890 ONTO CROSSTUBE. BE SURE TO ELIMINATE ANY AIR GAPS.
- 15) TORQUE CLAMPS ON D4909-1 SUPPORT 80 TO 100 IN-LB. TORQUE CLAMPS ON D4910-1 CHAFING SHIELD 40 TO 50 IN-LB. ENSURE AT LEAST 1.5 THREADS SHOWING IN SAFETY AND THAT NUT HAS NOT BOTTOMED-OUT AFTER TORQUING. PRIOR TO PACKAGING, RE-CHECK TORQUE ON CLAMPS AFTER ADHESIVES HAVE CURED FOR 24 HOURS.

STANDARD
UNCONTROLLED COPY
DATE: 15-05-21
MLJ

UNDER REVIEW

UP 15/4/24
LRF 15-581

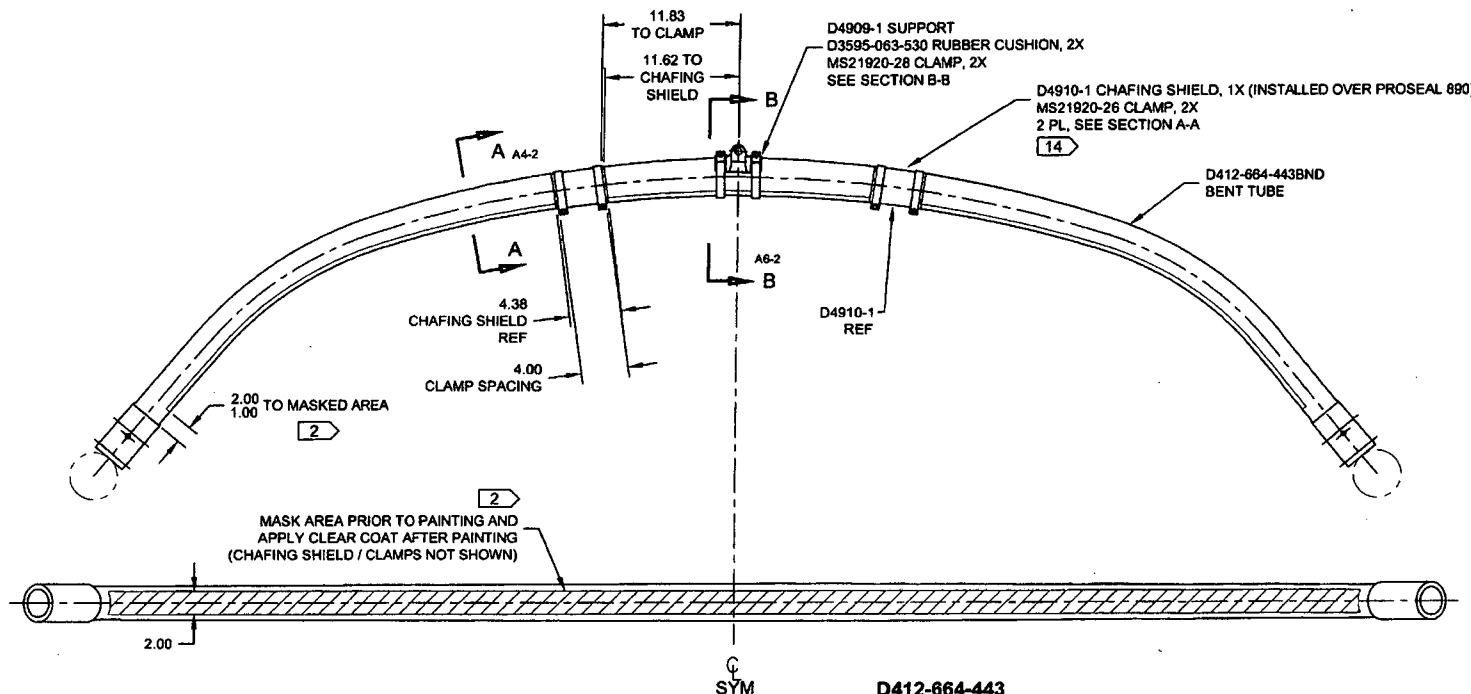
UNDER REVIEW

OK
P
N/H/M
17/4/24
URG R-69

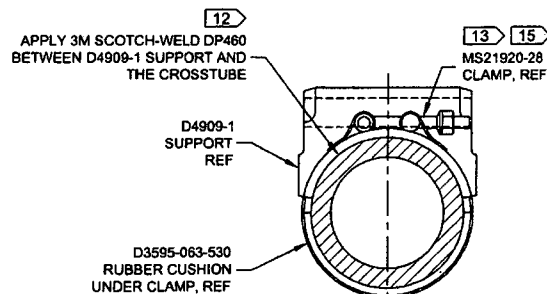
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R 2014-05-26
WPD

A	NEW ISSUE	CP	14.04.01
REV.	DESCRIPTION	BY	DATE
DESIGN			
DRAWN			
CHECKED			
MFG. APPR.			
APPROVED			
DE APPR.			
DATE	14.04.01		

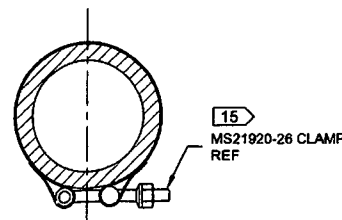
DART AEROSPACE LTD HAWKESBURY, ONTARIO, CANADA	
DRAWING NO. D412-664-443	REV. A SHEET 1 OF 4
TITLE CROSSTUBE ASSY (412 HI AFT)	SCALE NTS
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D412-664-443
ASSEMBLY DETAIL



SECTION B-B D4-2
SCALE 4X



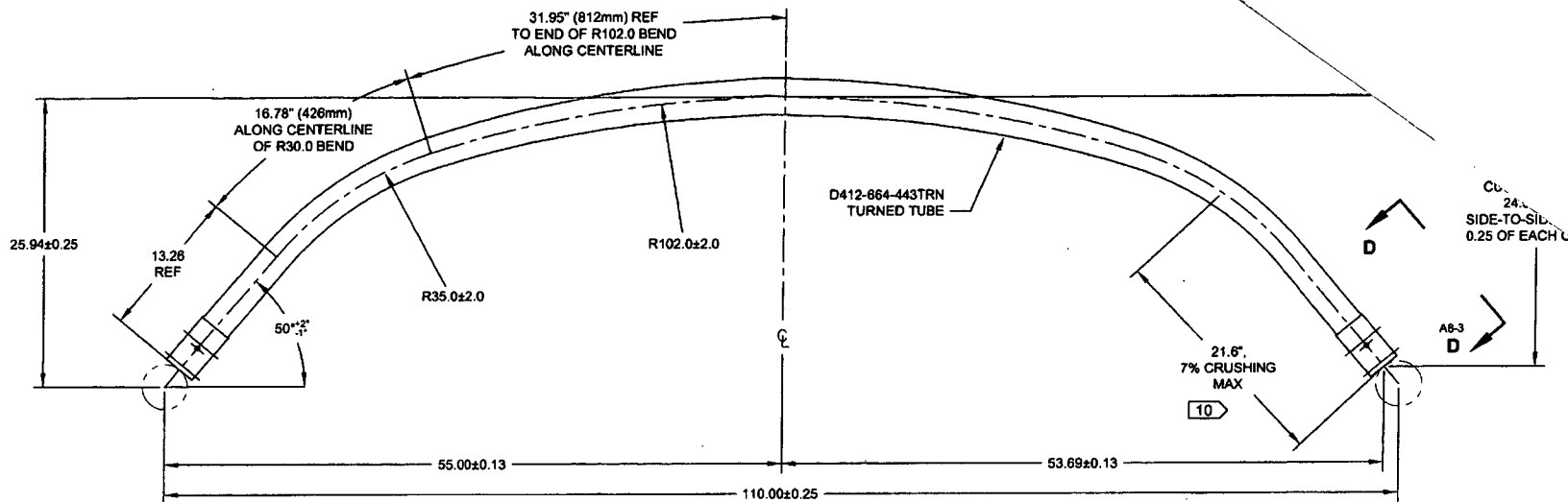
SECTION A-A C6-2
SCALE 4X

UNDER REVIEW
OK 1/14/14 1/17/16 1/17/16

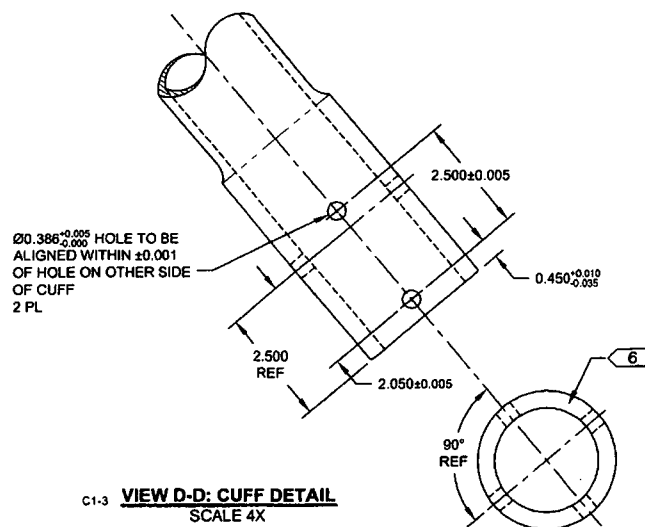
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2014-05-26

UNDER REVIEW
OK 1/14/14

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DRAWN	q	HAWKESBURY, ONTARIO, CANADA	
CHECKED	DW	DRAWING NO.	REV. A
MFG. APPR.		D412-664-443	SHEET 2 OF 4
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D412-664-443BND
BENDING DETAIL



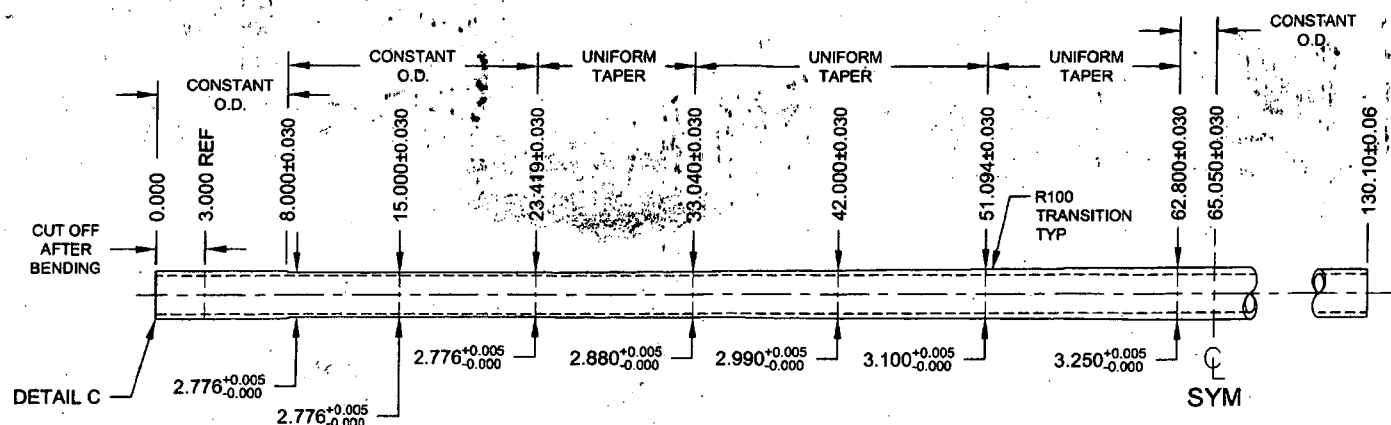
C1-3 **VIEW D-D: CUFF DETAIL**
SCALE 4X

OK
9/14/14
UNDER REVIEW
11/13/14

UNDER REVIEW
15/4/23

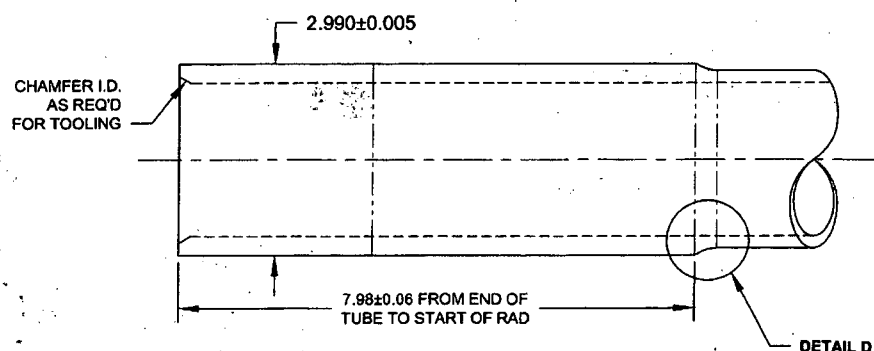
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2014-05-26

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MFG. APPR.		D412-664-443	SHEET 3 OF 4
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DE APPR.		CROSSTUBE ASSY (412 HI AFT)	NTS
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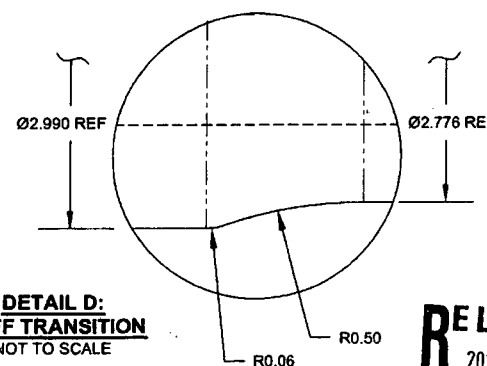


D412-664-443TRN
TURNING DETAIL

UNDER REVIEW
UP 1514/28



DETAIL C:
CUFF TRANSITION
SCALE 4X



DETAIL D:
CUFF TRANSITION
NOT TO SCALE

RELEASED
2014-05-26

DESIGN	97	DART AEROSPACE LTD	
DRAWN	97	HAWKESBURY, ONTARIO, CANADA	
CHECKED	97	DRAWING NO.	REV. A
MFG. APPR.	97	D412-664-443	SHEET 4 OF 4
APPROVED	97	TITLE	SCALE
DE APPR.	97	CROSSTUBE ASSEMBLY (412 HI AFT)	NTS
DATE	14.04.01	COPYRIGHT © 2013 BY DART AEROSPACE LTD	
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D412-664-443 B132986

15/3/16

Check marks above cff @ 15" from ad. After buffing
 c.d. is 2.765" (avg = 2.776). Min wall is 0.152 which is
 greater than dry nominal (0.188). Check if section
 with reduced wall is critical in bending:

$$I_H = 1.286 \text{ in}^4 \quad C_H = 2.774 \text{ in}^4 \quad C_B = 3.089/2 = 1.544 \text{ in}$$

$$F = \frac{M_c}{M_s} \quad M_s = F_H / F_H - 1$$

$$M_s = (40.118 \cdot 1.544 \cdot 1.246) / (9.028 \cdot 1.388 \cdot 2.835) - 1$$

$$= 1.24$$

6" Section with reduced c.d.

near cff is not critical in bending

